

## SOME AVIAN FLYWAYS OF WESTERN AMERICA

BY LOYE MILLER

MUCH has been written concerning the pathways followed by birds that pass back and forth in seasonal migration but, in North America, these items pertain largely to the eastern and mid-western sections. Many of the routes followed are hypothetical, being drawn with the ruler laid down on the map and connecting the breeding area with wintering area or point of release with point of recapture, too little being known as to the specific route followed. Furthermore, even those excellent accounts that report the bird in actual transit deal with migrants flying at low elevations and where topography of land surface enters as a determining factor and the element of guidance receives the major emphasis.

In the western United States some local flylines seemingly are determined by contrasting elevation and the correlated conserving of energy on the part of the bird. Relatively low basins are isolated by high and abrupt mountain masses through which water gaps and faulting lines form the main pathways of communication. These mountain passes may constitute pathways of seasonal migration or of slower diffusion through a succession of years. The factors of guidance or of upwelling air currents may participate but they appear to be of minor significance.

Many years of field work on my part in California and Arizona have resulted in some rather distinct impressions supported by definite data. These impressions, used in oral presentation before classes in ornithology, I have been urged to present in some more permanent medium.

### THE ROLE OF FAULT LINES

One striking character in the physiography of California is the multitude of its fault lines. The San Andreas, Garlock, Elsinore, and Sierra Madre faults—to mention but a few, have I am confident had an influence upon bird movement (Fig. 1). My many camps along one or another of these lines have given me the feeling that they constitute fly-lines for birds that are even more definite than some of the sky-ways of human aviators and sometimes for comparable reasons.

*The San Andreas Fault.*—This great fault begins with the extended trough of the Gulf of California, in Mexico. Here in late March of 1938, I watched the California Gulls (*Larus californicus*) organizing their bands to set forth on the northwestward drift to the breeding grounds in the basin country of California and Nevada.

Farther along this fault the Coachella Valley, leading into San Gorgonio Pass, offers a pathway ranging from below sea level at Indio to approximately

2,000 feet at Banning, whereas the mountains on either side of the pass rise to 10,800 and 11,400 feet. Many observations have been made along this segment of the fault. Birds actually watched in transit are recorded as follows—

March 15, 1913.—A mixed flock of Vaux Swifts (*Chaetura vauxi*), Violet-green (*Tachycineta*), Cliff (*Petrochelidon*), Tree (*Iridoprocne*) and Barn (*Hirundo*) swallows moving slowly to the northwest.

April 18, 1916.—A flock of the same species moving similarly. In addition there was one Belted Kingfisher (*Megasceryle alcyon*) by himself.

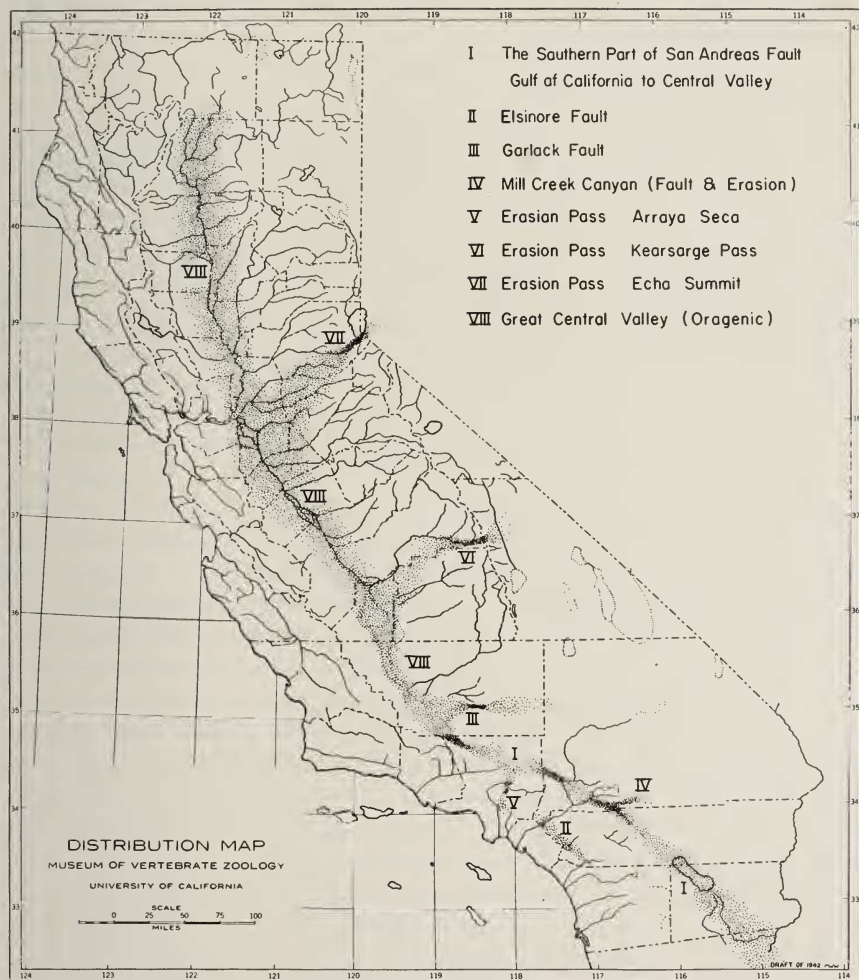


FIG. 1. Outline map locating routes in California that are mentioned in the text. Density of stippling suggests concentration of migrants through narrow parts of passes. Prepared by Gene Christman.

April 2, 1920.—Barn, Violet-green and Tree swallows in flocks. Not in flocks were Scott's Oriole (*Icterus parisorum*), Tolmie Warbler (*Oporornis tolmiei*), Yellow-throat (*Geothlypis trichas*) and Black-crowned Night Heron (*Nycticorax*).

March 26, 1921.—Violet-green Swallows in flock.

March 30, 1921.—A dozen *Phainopepla nitens* in a fairly close flock moving out through the pass.

April 8, 1922.—An Osprey (*Pandion haliaetus*) beating out the pass against the wind just above the desert shrubs. A large flock of Swainson's Hawks (*Buteo swainsoni*) tarried to feed on sphynx moth larvae at a point below sea level. On one spring trip a flock of White-fronted Geese (*Anser albifrons*) worked northward through the pass near White-water Ranch. They were flying less than 15 feet above the creosote bushes and tacking back and forth against a strong headwind.

April 9, 1922.—Large numbers of Lewis Woodpeckers (*Asyndesmus lewis*) at the north-western end of the pass below Beaumont.

Further items are merely repetitious and need not be included.

From San Gorgonio Pass the fault leads northwest through Cajon Pass and Swarthout Canyon to Antelope Valley, which is occupied by desert vegetation of Joshua tree, creosote bush, various cacti and sagebrush. Here during the spring migrations, I have observed steadily moving flocks of sandpipers and White Pelicans (*Pelecanus erythrorhynchos*) close above the Joshua tree forest and a single Bonaparte Gull (*Larus philadelphia*) in high plumage that seemed to be catching a meal of grasshoppers *en route*.

Near old Fort Tejon the San Andreas Fault breaks across the southern end of the great Interior Valley of California, the Sacramento-San Joaquin basin that runs for the major part of the length of the state at an elevation of less than 2,000 feet and migrant birds have no further need of the great fault as a flyway to the northward.

The local subsidiary fault of Mill Creek Canyon lies parallel with San Gorgonio Pass but at a higher elevation. It is separated by a relatively low notch from the Whitewater River on the desert side and debauches into the San Bernardino Valley to the westward where it connects with Cajon Pass of the major San Andreas Fault. On August 24, 1913, just before sunset, I saw a flock of Phainopeplas flying through this canyon in close formation like a flock of blackbirds. They are not found in this canyon ordinarily but these individuals were seemingly moving from the San Bernardino area to their wintering grounds in the Colorado Desert, perhaps as far south as Sonora. Abundant mistletoe berries furnish a winter food supply for a large population of this species in the Colorado Desert basin.

*The Elsinore Fault.*—In the early history of California as a state the Butterfield Stage Company played an important part in connecting coastal southern California with the eastern United States. Part of the stage route through the mountain and desert barrier to the eastward followed the Elsinore Fault that opens into the valley of the Santa Ana River near the present city of Corona. Along this fault near the site of the former stage station of Temescal

I found on April 9 of 1907, numbers of Lewis Woodpeckers in northward movement and in August of 1908 large flocks of White Pelicans.

The ephemeral Lake Elsinore and Lee Lake occupy this depression. In certain rainfall cycles, the White Pelicans are abundant on Lake Elsinore. The Santa Ana Mountains rise very abruptly to an elevation of 5,600 feet along the west side of the fault. The pelicans seemingly preferred not to scale this high wall.

*The Garlock Fault.*—This transverse fault extends for many miles across the southern end of the Sierran block to cut through the mountains east of Bakersfield via Tehachapi Pass and connect the Mojave Desert with the great Central Valley. Through this pass two great railway systems send all their eastbound traffic from the San Joaquin Valley. The Garlock joins the San Andreas Fault in the vicinity of old Fort Tejon. Along its course there may have diffused the several species of desert plants and animals that are found in the southern end of the San Joaquin Valley.

Only once have I been fortunate enough to observe it as a "fly-line" in active use. On one of my spring trips to Berkeley, I stood on the observation platform of a Southern Pacific train near Mojave Station and watched a flock of gray geese flying low over the desert scrub, overtake our laboring train and pass on through the notch cut through the Tehachapi Mountains by the Garlock Fault.

#### THE ROLE OF EROSION PASSES

A fascinating aspect of biologic study in southern Arizona is the mixture of northern and southern faunas that one encounters there. This blending takes place, to be sure, across a man-made political boundary not visible to the wild creature. Nevertheless there are certain pathways that are recognizable. Two of these have been especially evident in my field studies. One of them is the valley of the Santa Cruz River. From the region of Nogales it runs northward to join the Gila River beyond Tucson and thence into the great Colorado basin. The Beardless Flycatcher (*Camptostoma imberbe*), Ferruginous Pigmy Owl (*Glaucidium brasilianum*), and Boat-tailed Grackle (*Cassidix mexicanus*), to mention but a few, come northward along this path into Arizona.

In early April of 1894, I saw a flock of about a dozen Black-headed Grosbeaks (*Phœucticus melanocephalus*) migrating along this fly line. They were all males, they were in a compact flock and moved steadily northward over the desert vegetation just out of old Tucson.

About 15 miles west of Nogales the Pajarito Mountains are cut through by the narrow gorge of Sycamore Canyon that is occupied by a stream flowing south into the Magdalena drainage of Sonora. By way of this canyon we

have received from Mexico a number of plant species, a small minnow, a frog, and a tree snake. On June 30, 1945, all at once the canyon was enlivened with the calls of many Yellow-billed Cuckoos. They were not there during the two previous days and by July 2 they were heard no more. On June 30, also, two strange raptors were observed passing through the gorge close to our camp. My camp mate, A. J. van Rossem, and I saw them but neither could name them. We were quite in agreement, however, that they were strangers to the North American fauna. They disappeared slowly down the gorge and have remained an enigma ever since.

The San Gabriel Mountains of California make up the east-west barrier that separates the coastal plain of the Los Angeles area from the Mojave Basin to the northward. The deepest erosion notch through this range is cut by the Arroyo Seco that descends into the busy metropolitan area near where the little Mexican pueblo of Nuestra Senora La Reina de Los Angeles was first established in the early days of Spanish colonization.

For 25 years my home was on the west bank of this waterway that I soon learned was likewise a flyway. A high gear automobile road now takes advantage of this gateway through the wall but the birds must have used it for a geologic period. Time and again we have stood on our overlook balcony and watched the flocks of White Pelicans ploughing the air up the Arroyo Seco only a few hundred feet above the housetops. About the last of March I would begin to expect them and have even made bold at times to predict (with success) that, within the week, some of us would see the White Pelicans passing northward up the canyon headed for the Great Basin. One spring I happened to be on the slopes of Mt. Wilson when a flock came in. They had not gained quite enough altitude to take them safely through the notch, so they had to circle in an up current. I actually looked down upon the backs of these great birds, some of them measuring upwards of eight feet in wing spread. They looked most incongruous against the pine trees of the mountain sides.

Much of the eastern border of California is separated from the Great Basin area by the high, abrupt wall of the Sierra Nevada. In this area altitude must certainly influence the course of migration, since much of the range lies at 12,000 feet or more, and gateways at lower levels offer a distinct advantage to heavy bodied birds during extended flights.

One such gateway lies at the head of the American River near which I camped for two summers. Here again the White Pelicans were observed on June 15, 1919, passing between the interior valley of California and their breeding grounds at Pyramid Lake in the Great Basin country. They flew so low over the pine tops that the rush of their wings was like escaping steam.

Another summer we were camped at Bull Frog Lake on the west side of Kearsarge Pass in the southern part of the Sierra. On August 23, 1928, I



stumbled up to the pass in the half light of dawn to watch the sun come up out of the desert to the eastward. I was soon diverted, however, to bird-watching and spent nearly four hours beside the survey marker that registered 11,823 feet. Peaks rose abruptly another thousand or more feet on either side, the divide was almost knife-edge sharp and devoid of vegetation, yet birds were moving through. Chipping Sparrows (*Spizella passerina*), Audubon's Warblers (*Dendroica audubonii*) and a small greenish warbler passed through from the west. One Red-tailed Hawk (*Buteo jamaicensis*) went through but the most impressive was a flock of White-fronted Geese (*Anser albifrons*). Just as the sun came up a dozen of these geese came wedging their way in from the northeast headed for their wintering grounds among the grain fields of the great Central Valley. They cleared the pass by what seemed only a few inches—almost scraping their checkered breasts on the sharp rocks but a few dozen yards from me. They had probably been flying all night and they were conserving every ounce of fuel. Their steady wing beats carried them through the notch and out over the lower parts of the canyon where the sun had not yet risen. I saw them disappear into the blue shadow whence they could plane down to a resting ground in the marshy country about Buena Vista or Tulare lakes. I wondered how many generations of their ancestors had followed that same trail through the notch of Kearsarge Pass.

True it is that many observations have been made that record birds migrating at fairly high altitudes and quite independent of surface topography. Here they may gain ultimately by advantageous air currents or meteorologic "fronts." On the other hand, I am inclined to believe that, all other factors being equal, the bird will fly at a moderate altitude if no barrier confronts him, and that mountain passes here in the West have determined some very definite fly lines.

#### SUMMARY

Actual observations of moving birds through mountain passes in California and Arizona are put on record. These passes are discussed under two heads—fault lines and erosion gaps. It is postulated that altitude is an important factor in the bird's metabolic economy during migration. Hence it may determine the migration route.

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